

## *Gammarus inaequicauda* Stock, 1966 in Norway (Crustacea, Amphipoda)

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Vader, W., Christophersen, C.G., Kempe, J. & Skadsheim, A. 1984. *Gammarus inaequicauda* Stock, 1966 in Norway (Crustacea, Amphipoda). *Fauna norv. Ser. A* 5, 9–13.

The amphipod *Gammarus inaequicauda* Stock, 1966, earlier in Norway only known from Sars' vague type-locality 'Moss, Christianiafjord', has been found at several localities in the Oslo fjord and along the Skagerak coast of southern Norway.

All Norwegian localities are shallow, densely vegetated protected inshore habitats, with salinities at least periodically below that of the open coast. Common associated crustaceans are the amphipods *Corophium insidiosum* Crawford, *Erichthonius brasiliensis* (Dana), *Microdeutopus anomalus* Rathke, *M. gryllotalpa* (Dana) and *Phtisica marina* Slabber, and the isopod *Idotea chelipes* (Pallas).

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### INTRODUCTION

Amphipods of the genus *Gammarus* sensu lato are common and often numerous in habitats ranging from inland freshwater through different types of brackish habitats to coastal marine areas; the group is probably of freshwater origin (Barnard & Barnard 1983). The many species are morphologically very similar (Vader 1972, Lincoln 1979). The genetic relationship within the genus *Gammarus* s.l., measured as loci coding for enzymes with similar structure, may vary from 0 to more than 80% similarly coding loci (Bulnheim & Scholl 1981, Kolding & Simonsen 1983, Skadsheim & Siegismund in press). *Gammarus* species are, nevertheless, usually fully reproductively isolated (Brun & Brun 1964, Goedmakers & Roux 1975), and they also show clear differences in ecological preferences (e.g. Steele & Steele 1975, Ingolfsson 1977, Fenchel & Kolding 1979, Kolding 1981, Skadsheim 1983, 1984).

In Norway outside the Arctic 13 species of *Gammarus* s.l. are known to occur (Vader 1972). Among these *Gammarus inaequicauda* Stock, 1966 (= *Gammarus campylops* s. Sars 1894, non Leach 1814) is least well known. For many years the vague type-locality 'Moss, Christianiafjord' was the only locality known (Stock & Kant 1966) and outside Norway *G. in-*

*aequicauda* has hitherto only been found in Poland (Jażdżewski 1970a). Jażdżewski (1975) is of the opinion that the so-called 'hybrids between *G. locusta* and *G. oceanicus*' collected from the Askö laboratory in SE Sweden and mentioned by Nyman and Westin (1969), in reality may have been *G. inaequicauda*. Unfortunately this material is no longer extant.

### Taxonomy and Identification

*Gammarus inaequicauda* belongs to the *locusta*-group, a complex of *Gammarus* species previously confused under the name *Gammarus locusta* (L.) and monographed by Stock (1966, 1967). The *locusta*-group is characterized by the well developed outer ramus of uropod 3, the nature of the armament of the propodus of gnathopod 2 in the male, and by the arrangement of the spinules on the distal article of the mandibular palp. In the *locusta*-group this article is ventrally armed with a row of comb-like spinules that diminish regularly in size in proximal direction (Fig. 1 A). In other species of *Gammarus* s.l. these comb-spinules are either of uniform length (Fig. 1 B) or they vary irregularly in length (Fig. 1 C); unfortunately, a recently discovered aberrant form of *G. oceanicus* Segerstråle with *lo-*

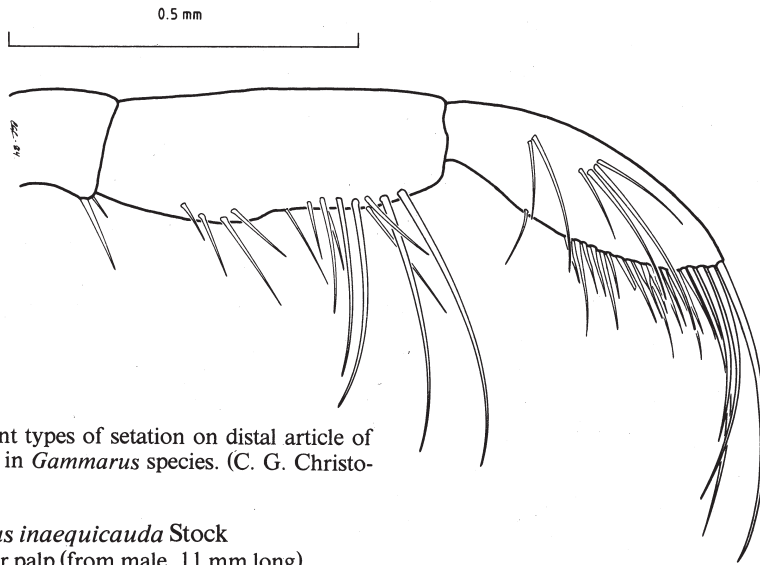
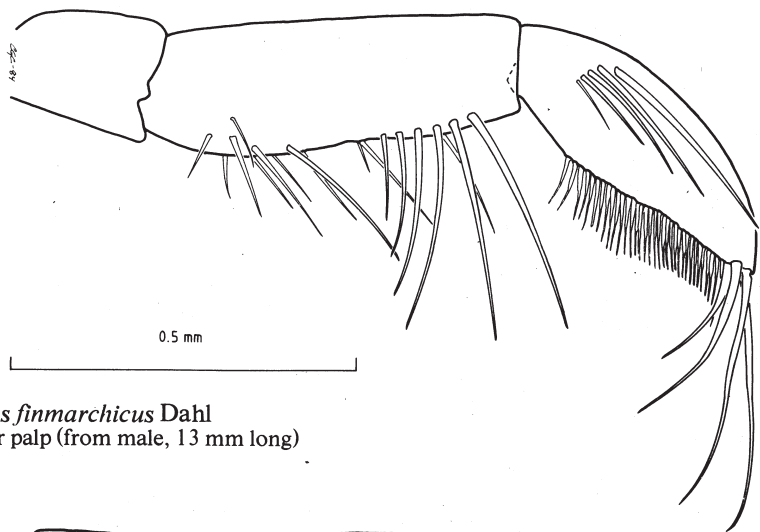
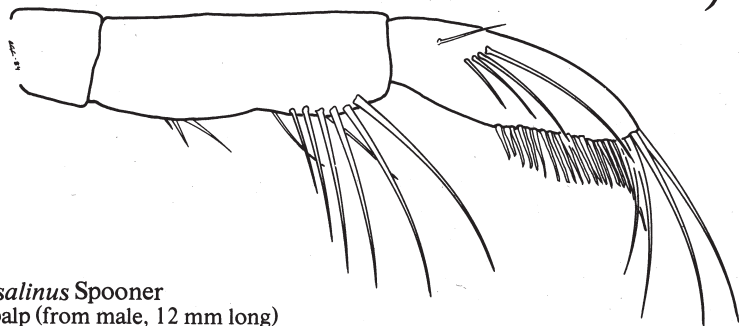


Fig. 1. Different types of setation on distal article of mandible palp in *Gammarus* species. (C. G. Christophersen del.)

A. *Gammarus inaequicauda* Stock  
Mandibular palp (from male, 11 mm long)



B. *Gammarus finmarchicus* Dahl  
Mandibular palp (from male, 13 mm long)



C. *Gammarus salinus* Spooner  
Mandibular palp (from male, 12 mm long)

*custa*-like mandible palp confuses the picture to a certain extent (Dennert 1973, Christophersen, unpubl. obs.).

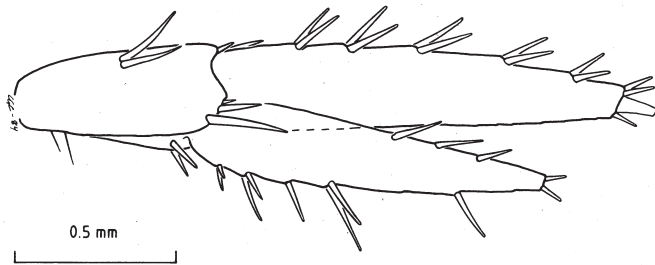
*Gammarus inaequicauda* is one of the smaller species of the *locusta*-group; its name is derived from the marked inequality in length of the rami of uropod 3 (Fig. 2). A further diagnostic characteristic of *G. inaequicauda* is the absence of the strongly compressed urosome buckles of *G. locusta*. *G. inaequicauda* is very closely related to, and may not be specifically different from, the more southern *G. insensibilis* Stock, 1966, an inhabitant of coastal and lagoonal habitats of the Black Sea and Mediterranean (Ruffo 1982) and the Atlantic coasts north to southern England (Lincoln 1979). Cross-breeding experiments

should be performed to decide whether *G. inaequicauda* is only the extreme in a cline of morphological variation within *G. insensibilis* or an independent, reproductively isolated, species.

## DISTRIBUTION

Outside Norway *Gammarus inaequicauda* has hitherto only been recorded from Polish waters: the species is very common in the Bay of Puck and also present, although sparingly, further east in the Gulf of Gdansk (Jażdżewski 1970a). *G. inaequicauda* appears to be absent from Finnish waters (Segestråle 1971); possible old Baltic records are discussed by Jażdżewski (1975).

The known Norwegian localities of *G. inae-*



*Gammarus inaequicauda* Stock.  
Uropod 3. Setae omitted.  
(from male, 11 mm long)

Fig. 2



*Gammarus locusta* (Linnaeus). Uropod 3. Setae omitted (from male, 18 mm long) (C. G. Christophersen del.)

Table 1. Norwegian localities of *Gammarus inaequicauda* Stock. The numbers correspond to those in Figure 3.

No.	Locality	Characteristics	Collector/date
1.	Halangspollen, Drøbak sound	'Poll' (= protected bight with shallow, narrow outflow, 0.5–1 m, among <i>Enteromorpha clathrata</i> )	J. Kempe 1983
2.	Moss (type locality)	No data available	cf. Stock & Kant 1966
3.	Sigtøy, Brevikfjorden	Protected bight in sound. <i>Fucus</i> and green algae on mud with scattered stones 0.2–0.8 m.	W. Vader 1983
4.	Grimstad (several localities)	Protected lagoons. <i>Zostera</i> -meadows 0.5–2 m	P.B. Wikander 1970, 1971 (W.V.det.)
5.	Kristiansand, Indre Drangsvann	'Poll', among green algae of <i>Cladophora</i> -type, 0.1–1.0 m	C. Christophersen 1973, 1982, 1983
6.	Søgne, Indre Kilen	'Poll', among green algae of <i>Cladophora</i> -type, 0.3–0.5 m	C. Christophersen 1982, 1983

*quicauda* are tabulated in Table 1 and mapped in Fig. 3; they are all along the Skagerak coast of southern Norway, which is still poorly known faunistically. Further collecting will probably show *G. inaequicauda* to be a widespread and characteristic species in this region. The species has hitherto not been found in the somewhat better investigated Bergen area of W. Norway.

#### BIOTOPE AND BIOLOGY

The type material of *Gammarus inaequicauda*

was not accompanied by any ecological data (Stock & Kant 1966). In the Bay of Puck, at salinities of c. 7‰, *G. inaequicauda* prefers subtidal localities with much vegetation (either the *Fuceto-Furcellietum* algal community, or underwater meadows with *Zostera* and *Potamogeton*) at depths of 4–6 m, where it is the dominant *Gammarus* species. At shallower depths the species is greatly outnumbered by *G. zaddachi* Sexton in Spooner (Jażdżewski 1970a, 1973). Ovigerous females were found from May to October, with three generations per year (Jażdżewski

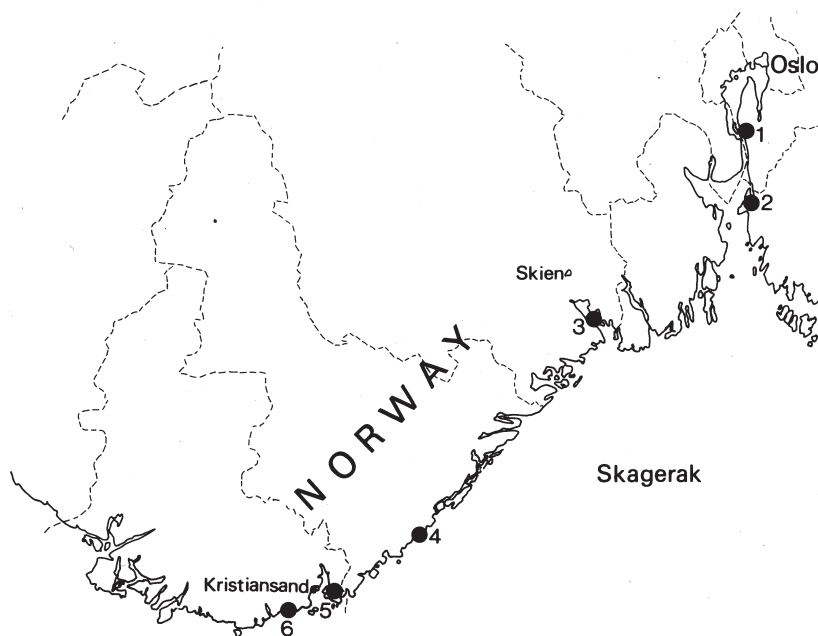


Fig. 3. Norwegian records of *Gammarus inaequicauda* Stock. The numbers correspond to those in Table 1.

1970b). Common associated crustacean species in the Bay of Puck are the amphipods *Gammarus zaddachi* Sexton, *G. salinus* Spooner, *Melita palmata* (Mont.) and *Leptocheirus pilosus* Zaddach, the isopods *Idotea chelipes* (Pallas) and *Jassa* spp., the tanaid *Heterotanais oerstedii* and the mysid *Praunus flexuosus* (Jazdzewski, in litt.).

The biology of the closely related species *Gammarus insensibilis* is better known. Greze (1972) and Janssen et al. (1979) have studied its reproductive biology and biotope choice on the Black Sea coast and in a French Mediterranean lagoon, respectively, and Labourg et al. (1971) its ecological distribution in the Bassin d'Arcachon in southwestern France. In Mediterranean waters *G. insensibilis* has been recorded from apparently wholly marine habitats, but more often from lagoonal areas (Ruffo 1982). At the northern limit of distribution, in southern England, *G. insensibilis* has only been found in brackish, landlocked waters (Lincoln 1979).

The Norwegian localities of *Gammarus inaequicauda* have a number of traits in common and fit quite well in the above pattern. All known localities are subtidal, densely vegetated protected bays or 'poll'-like habitats, with salinities at least periodically below that of the open coast. The exact type of vegetation seems to be of less importance and green algae (*Enteromorpha clathrata*), Fucaceae, *Zostera* and *Ruppia* have all been found. At the locality Halangspollen (Table 1, loc. no. 1) *G. inaequicauda* apparently occupied a zone below *Gammarus salinus* Spooner, while both *G. salinus* and *G. duebeni* Lilljeborg were found in very shallow water at Sigtesøy (Table 1, loc. no. 3). Common associated crustaceans at most localities are the amphipods *Corophium insidiosum* Crawford, *Erichthonius brasiliensis* (Dana), *Microdeutopus gryllotalpa* (Dana), *M. anomalus* Rathke and *Phtisica marina* Slabber, and the isopod *Idotea chelipes* (Pallas), all species with a boreal distribution pattern (Lincoln 1979) and a preference for protected poikilohaline habitats.

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## ERRATUM

In the paper *Gammarus inaequicauda* Stock, 1966 in Norway (Crustacea, Amphipoda) by Wim Vader, Carlos G. Christophersen, Jochen Kempe & Arnfinn Skadsheim (Fauna norv. Ser A 5, 9–13, 1984) Figures 1 A and C have inadvertently been interchanged. Thus, the upper figure depicts the mandibular palp of *Gammarus salinus* and lower figure that of *G. inaequicauda* Stock.